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THE CARE OF CREAM FOR BUTTERMAKING

BY

GEO. H. BARR
Chief, Dairy Division.

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LETTER OF TRANSMITTAL.

OTTAWA, February 20, 1912.

To the Honourable
The Minister of Agriculture.

SIR,—I have the honour to submit for your approval, the manuscript for a bulletin on 'The Care of Cream for Buttermaking,' which has been prepared under my direction by Mr. Geo. H. Barr, Chief of the Dairy Division of this Branch. The information contained herein is derived from the pages of a previous bulletin and from the results of recent investigations carried on by the Dairy Division. I beg to recommend that it be printed for distribution as Bulletin No. 32 of the Dairy and Cold Storage Series.

I have the honour to be, Sir,
Your obedient servant,

J. A. RUDDICK,
Dairy and Cold Storage Commissioner.

THE CARE OF CREAM FOR BUTTERMAKING.

BY

Geo. H. Barr,

Chief of the Dairy Division.

The manufacture of butter in creameries on what is known as the gathered cream plan is becoming more and more general throughout Canada. The advantage of having fresh warm skimmilk for feeding purposes, the desire to avoid the risk of getting disease in their herds from the mixed skimmilk from a larger number of farms, together with a lower cost of hauling and, in most cases, a lower cost for manufacturing the butter, makes the system popular with many milk producers.

On the other hand, the fact must be recognized that in most cases a change from the system of separating the milk at the creamery to that of gathering the cream, has resulted in an inferior quality of butter being made, for the reason that the quality of the cream separated at the farms, when delivered at the creameries, is not as fine as that from milk separated at the creamery.

Cream which is separated on the farm can be delivered to the creamery in as good condition as that which is separated at the creamery. It is simply a question of the patron who skims his milk at home taking proper care of the cream and having it delivered to the creamery often enough.

It is admitted by all creamery authorities that finer butter can be made from cream which is sweet when delivered at the creamery, than from cream which is sour and curdled. It is also well known that any taint that may be in the milk or cream will be to some extent carried into the butter. Therefore, the producer will see at once the responsibility resting upon him in securing a fine flavoured butter at the creamery.

In the production of fine flavoured cream, the same precautions must be observed as those which are necessary in furnishing milk to separator creameries or to cheese factories. The following are some of the essential points:—

Feeds that will Injure the Flavour of the Butter, and which should not be Fed to Milch Cows.

1. Turnips and turnip tops.
2. Rape or rye.
3. Decayed ensilage.
4. Leeks, onions, or apples in large quantities.

Other Causes of Taints in Cream.

1. Cows' udders and teats in an unclean condition at milking time.
2. Milking in unclean stables.
3. Using unclean, wooden, galvanized or rusty milking pails.

4. Separating the milk in the stable.
5. Improperly cleaned separators.
6. Keeping the c. ·m in cellars or other places where there are roots or vegetables.
7. Keeping the cream for several days at a temperature over 55 degrees.
8. Cows drinking water from stagnant ponds, or the leakage from barnyards.

Conditions that are Necessary to Produce Fine-flavoured Cream.

Pure Water.—The cows should have at all times an abundant supply of pure water to drink. When cows are compelled to drink the water of swamps, muddy ponds or sluggish streams and ditches, in which there is decaying animal matter, including their own droppings, there is a constant menace to their health, and unless the cows are in good health, they cannot give first-class milk. Moreover, the mud, often full of foul germs, which collects on the legs, flanks and udders of the cows and falls into the milk at the time of milking, is a direct source of infection.

Salt.—When cows have free access to salt at all times, they will keep in better health, will give more milk, and the cream from this milk will have a better flavour, and keep sweet longer, than when they do not get any at all, or receive it only at intervals.

Milking.—Cleanliness in the stable is desirable at all times, but especially at milking time should the stables be clean and free from dust. The udders, teats and flanks of the cow should be brushed before milking. Only bright, clean tin pails should be used to milk in. Galvanized pails are difficult to keep clean, and bad flavours have been traced to their use.

The Hand Power Separator.

The hand power cream separator is the most reliable and best method of skimming milk at the farm, and the only method that can be recommended. Nearly all the separators on the market will do efficient skimming if properly handled.

Handling and Care of the Separator.—It is important that the separator runs smoothly. Any trembling or shaking of the separator while skimming will cause a loss of butter fat in the skimmilk. Only special separator oil should be used, and it is well to make a run about once in three weeks, using kerosene oil on all the bearings.

In skimming, three things must be observed: (1) The speed of the separator must be maintained according to the directions sent with it. The only reliable way to do this, is to count the number of revolutions of the crank by the watch. A low speed means loss of fat in the skimmilk. (2) The flow of the milk into the separator should be uniform. (3) The temperature of the milk should not be under 90 degrees, and for that reason, the best time to separate the milk is immediately after milking. A low temperature is also liable to cause loss of fat in the skimmilk. The faster the milk passes through the separator, the less complete is the separation, and a thinner cream is given. One of the questions often asked by patrons is: Why does my test vary so? When one knows that the speed of the machine, the flow of the

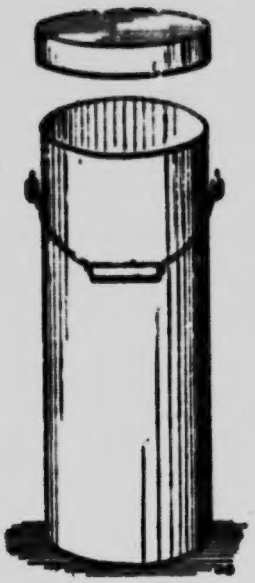

FIG. 1.

FIG 2

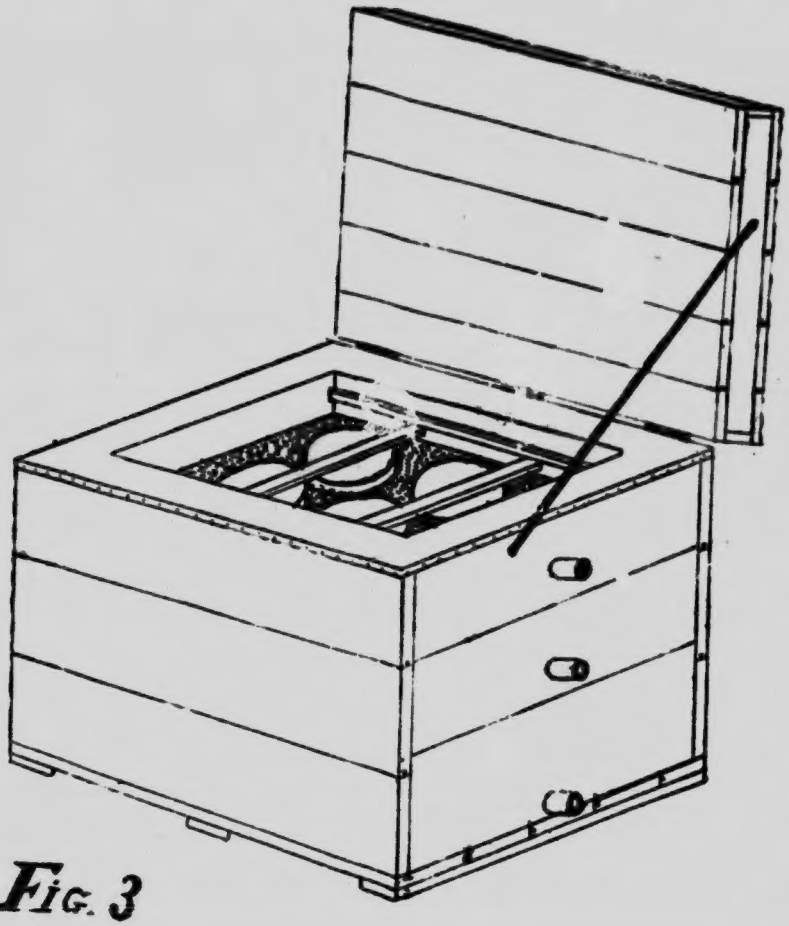

FIG. 3

milk, and the temperature of the milk all affect the test of the cream, it is not difficult to understand why it may vary considerably. A variation in the test does not necessarily mean any loss to the patron. Every separator has some device for changing the test of the cream. In most cases the adjustment is at the cream outlet. If so, by turning the cream screw in, the cream will be richer, and by turning it out, the cream will be thinner.

All the parts of the separator which come in contact with the milk or cream should be washed in luke warm water, to which has been added a small quantity of sal soda or other cleansing powder, and then thoroughly scalded with boiling water each time the separator is used.

Location of Separator.—In some cases the separators are placed in the cow stables. This may be a convenient arrangement, but it is not by any means a proper place for separating milk, unless a special room, well ventilated and lighted, is partitioned off to exclude the stable odours and dust. This room should have a smooth cement floor, which can be easily cleaned.

Advantages of a Rich Cream.—It is doubtful if there is any one thing which injures the quality of gathered cream butter so much as *thin cream.* Thin cream is responsible to a large extent for the old sour cream flavour so frequently found on gathered cream butter.

Many patrons have the idea that a large amount of cream should give a correspondingly large amount of money, forgetting that they are paid only for the butter fat in the cream, or the butter made from the fat.

Skimming a rich cream is a decided advantage to the patrons in more ways than one. The following table shows the advantage with reference to hauling and the amount of skimmilk retained on the farm, of skimming a rich cream with a herd of ten cows averaging 4,000 lbs. of 3·5 per cent milk.

TABLE I.—TOTAL MILK 40,000 LBS. TOTAL BUTTER FAT 1,400 LBS.

	Sent to the Creamery.		Kept on the Farm.	
Per cent fat in cream.	Butter Fat.	Cream.	Skimmilk.	Skimmilk.
	Lbs.	Lbs.	Lbs.	Extra lbs.
20.	1,400	7,000	33,000	-
25.	1,400	5,600	34,400	1,400
30.	1,400	4,662	35,338	2,338
35.	1,400	4,004	35,996	2,996
40.	1,400	3,500	36,500	3,500

The foregoing table shows that there is the same amount of fat sent to the creamery in all cases, but a very great difference in the amount of skimmilk left on the farm. An additional advantage is that there is less cream to take care of, and it is easier to keep it sweet.

Table II shows the results of experiments conducted by the Dairy Division, on keeping thick and thin cream from the same milk under exactly the same conditions for different periods.

TABLE II.

Cream kept.	Length of time kept.	Per cent fat in cream.	Temp. of cream.	Per cent acid in cream.
In the cellars	36 hrs	31·00	65·50	·430
" "	36 "	22·20	66·50	·540
In insulated tanks	36 hrs	31·67	57·50	·175
" "	36 "	22·00	57·70	·195
In insulated tanks	60 hrs	32·19	55·40	·380
" "	60 "	21·55	55·50	·440

These figures show that in every case the thin cream had the highest acidity, and it had always a much stronger flavour.

If all the cream sent to cream gathering creameries tested 30 per cent fat, it would mean thousands of dollars of extra money in the pockets of the patrons from more and better stock, and the quality of the butter would be very much improved.

Vessels for Holding Cream.—Many patrons keep the cream in earthen crocks, or in open pails. Crocks are liable to get broken or chipped, and experiments conducted at the O.A.C. Dairy School, Guelph, show that earthen crocks if chipped in any way cause an undesirable flavour in the butter. Cream kept in open pails is exposed to the air too much and, for that reason, is apt to become tainted. A well soldered plain bottomed tin can about 8 inches in diameter and 20 inches deep is the best vessel in which to keep cream. This style of can (Fig. 1) is easy to keep clean and handy to put into a tank of water and ice. When two lots are mixed, the cream should be well stirred. Fig. 2 shows a very useful utensil for this purpose.

Where to Keep the Cream.

Keeping Cream in Cellars.—A great deal more than half of the cream sent to the creameries is kept in cellars. Our own experiments proved that we could not keep cream sweet for thirty-six hours, or for delivery every other day, in cellars which were as cool as the ordinary run of farm house cellars; also that the cream when left uncovered developed a strong cellar flavour and the butter had a tendency to become rancid.

The following table shows the temperature, and acidity, by the acidimeter test, of cream kept in the cellars for different periods.

TABLE III.

Length of time kept.	Average temp. of cellars.	Average temp. of cream.	Averageper cent acid.
36 hrs.	63 7 deg.	64·5 deg.	·47
60 "	62·9 "	63·5 "	·50
72 "	64·0 "	64·0 "	·52

NOTE.—Freshly separated cream will have according to this test about ·13 per cent acid; the acidity continues to increase more or less rapidly, according to the temperature. When it reaches ·25 per cent, it begins to be perceptible to the taste,

and may be called 'sour.' The change is a gradual one, and the difference between what we call 'sweet' cream and 'sour' cream is one of degree only. The human sense of taste is not as delicate as the acidimeter test and cannot detect the same differences. When the cream reaches the stage of thickening, it has an acidity of about .35 per cent.

Keeping Cream in Water and Ice.—We have found that the easiest and best way to keep cream sweet and clean in flavour is to put it in a shot gun can (Fig. 1) and place it in a tank of water and ice immediately after skimming. We can recommend an insulated tank as shown in Fig. 3. This tank is made with a space of four inches filled with planing mill shavings on all sides and on the bottom, the cover also being insulated in the same manner. It is lined inside with galvanized iron. Such a tank is a little expensive, but it is certainly a great saver of ice. An ordinary wooden tank is next best. All tanks should have covers, as they help to keep down the temperature of the water and cream.

Table IV shows the advantage of keeping the cream in an insulated tank with water and ice, compared with the best results we could get by keeping it in the cellars. The cream was divided into two lots immediately after skimming, one lot set in the cellar and the other set in water and ice.

TABLE IV.

Treatment given the cream.	Length of time kept.	Average temp. of cream.	Average acidity of cream.
Cooled in tank	36 hrs.	52·8	·157
Set in cellar	36 "	64·5	·470
Cooled in tank	60 "	53·0	·165
Set in cellar	60 "	63·7	·505

These results show that the cellar cream had three times as much acid as that cooled in water and ice.

Keeping Cream in a Refrigerator.—Some people have recommended cooling the cream by placing it in a refrigerator immediately after skimming.

The following table shows the results of dividing cream equally into two lots, cooling one lot in ice and water and the other in a first-class refrigerator.

TABLE V.

Cream kept in.	Average temperature	Average acidity.	Ice used.
			Lbs.
Refrigerator	53·9 deg.	·415%	221
Ice and water	54·8 "	·230%	178

There were 43 lbs. more ice used in the refrigerator than in the water. The average temperature of the cream kept in the refrigerator was nearly one degree

lower, yet the acidity was almost twice as high. This is no doubt due to the fact that ice and water will cool the cream much faster than cold air.

The covers were kept on the cream cans in both cases and there was practically no difference in the flavour of the cream at any time.

Both lots of butter scored 42·5 points for flavour when fresh. When three weeks old, the butter from the water and ice cooled cream scored 40·77 points and the other 39·88 points.

Table VI shows the effect that different temperatures have on the acidity of cream kept for different periods.

TABLE VI.

Length of time kept.	Average temp. of cream.	Average per cent acid.
36 hours	50·6 deg.	·145
36 "	55·0 "	·170
36 "	57·5 "	·190
36 "	58·5 "	·210
36 "	64·0 "	·510
60 "	53·0 "	·150
60 "	55·5 "	·310
72 "	58·7 "	·380
84 "	47·5 "	·165
84 "	54 0 "	·390

It will be observed that when the cream was cooled to 55 degrees soon after skimming, it kept perfectly sweet for thirty-six hours, or for delivery to the creamery every other day. This temperature can be secured at most farms with the ordinary well water if an insulated tank is used. If this temperature cannot be secured with water alone, ice should be used.

To keep cream sweet for eighty-four hours, or for delivery twice a week, it must be kept down to 48 degrees. To do this, ice must be used. The lot kept eighty-four hours at 54 degrees was cooled in an insulated tank with water from the well at 48 degrees and changed night and morning. It was quite sour when delivered at the creamery.

We were able to keep cream perfectly sweet for eighty-four hours, but it did not have the clean pleasant flavour which is found on cream kept sweet for shorter periods.

Keeping the cream for longer than two days at the farms has, no doubt, much to do with the old cream flavour so common in gathered cream butter, and we can scarcely expect to have this defect remedied so long as cream is gathered less than three times each week.

When the cream is pasteurized at the creamery, the loss of butter fat in the buttermilk will be greater if the cream is sour than if delivered in a sweet condition. There is also a greater loss of fat in pasteurizing thin cream than thick. All cream separated at the farms should test between 27 and 35 per cent butter fat.

The Creamery Owner's Responsibility.

While asking the patrons to make improvement in their methods, we do not wish to relieve the creamery owners and managers of their responsibilities to the patrons.

They must see to it that the equipment of the creamery is such that the cream supplied is handled in the most efficient manner; that the testing is done accurately and honestly, and that the creamery is a model of cleanliness and a standing object lesson for the patrons.

These conditions cannot be secured or maintained unless there is a reasonable price paid for manufacturing. Modern creamery equipment is expensive, and it is an unwise policy on the part of the producers of cream to insist on such low prices for manufacturing that the creamerymen cannot afford to equip the creamery with modern appliances or to collect the cream at least three times a week. Cheap creamery equipment and cheap buttermakers may be very expensive in the end to cream producers. Both creamerymen and patrons should remember that a reputation for finest goods will ensure the highest current price and often a premium in addition. This enviable position can only be reached by every one doing his or her best and by having the closest co-operation and harmony in all the work relating to the creamery and the farm.

Summary of Important Notes.

For the Patron.

1. It pays to make cows comfortable at all times.

2. It pays to treat cows with invariable kindness. They should never be driven fast or worried by dogs.

3. Pure water should be provided for the cows, and they should be prohibited from drinking stagnant, impure water.

4. A box or trough containing salt, to which the cows have free access, should always be provided.

5. Care must be taken to avoid feeds that will taint the milk.

6. The udders and flanks of the cows should always be washed or brushed clean before milking is commenced.

7. Milk from a freshly calved cow should not be skimmed until after the eighth milking.

8. Only cream from cows in good health should be sent to the creamery.

9. Tin pails only should be used.

10. Cream delivered every other day should be cooled as quickly as possible to 55 degrees and kept at that temperature or lower. If kept longer it should be cooled to under 50 degrees.

11. Warm cream should never be mixed with cream already cooled.

12. Every patron sending cream to a creamery should provide ice for cooling it.

13. All vessels, *including separator bowl,* used in the handling of milk or cream, should be thoroughly cleaned immediately after they are used by washing in luke

warm water and then thoroughly scalded with boiling water. A brush is preferable to a cloth for washing tinware or separators.

For Creamery Owners.

1. Pasteurizing the cream will give a better keeping quality of butter.
2. The use of a pure culture or starter in gathered cream will improve the keeping quality of the butter.
3. If the cream is not pasteurized, provide for cooling it quickly when delivered to the creamery.
4. Provide an abundant supply of good, pure water for the creamery.
5. Provide cold storage that will keep the butter at about 40 degrees or lower.
6. Support your buttermaker in dealing firmly with patrons who send cream which is not in good condition.

For the Buttermaker.

1. Attend personally, as far as possible, to the taking in, sampling and testing of the cream.
2. Keep your creamery clean, bright and tidy. Also yourself and assistants.
3. Be satisfied only with the finest quality of butter, the cleanest and the most attractive surroundings.

Copies of this bulletin may be obtained free for each patron of a creamery, by application to the Dairy and Cold Storage Commissioner, Ottawa.